

Generation of Plasma Input Functions

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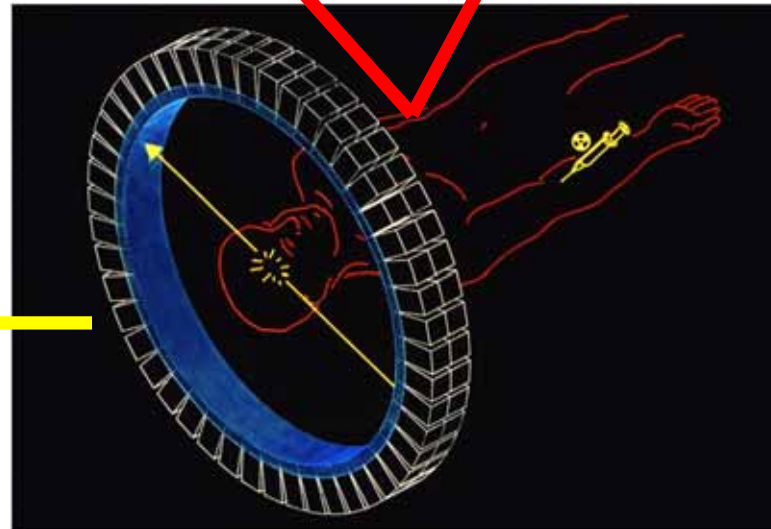
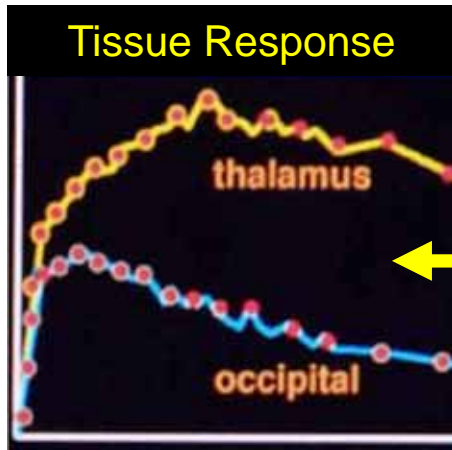
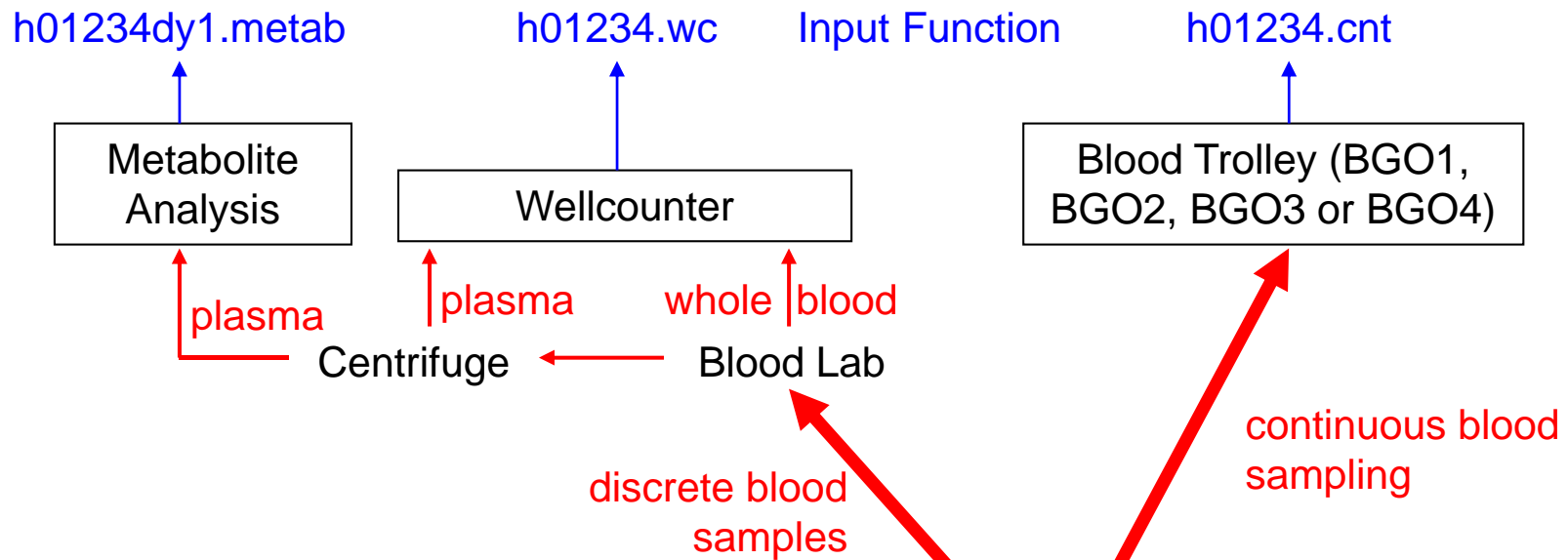
IRSL Methodology R & D

5th March 2003



Imaging
Research
Solutions
Limited

PET Measurements



Locating the Files

/net/owen/blood/SCRIPTS/GetStudy h02488

The following Directories/Files are located in
/net/dirac/PET_Data_1/Blood/ECAT966/h02000/h02488

Blood trolley h02488
backup file → h02488.bt3.gz
syringe file → h02488.syr
wellcounter file → h02488.wc
metabolite file → h02488dy1.metab

h02488 is a Directory and contains
h02488.hdr
h02488.key
h02488.oys
h02488.pot
h02488.sam
h02488.smp
h02488.wts

Image Directory for h02488 not found in
/net/dirac/PET_Data_1/Images/ECAT966/h02000

The following Directories/Files are located in
/net/dirac/PET_Data_3/Images/ECAT966/h02000/h
02488

Blood trolley file → H02488.cnt
 H02488.n
 H02488_1.tar
 h02488_lm1_ramp_C.3dimg
 h02488tr1.img

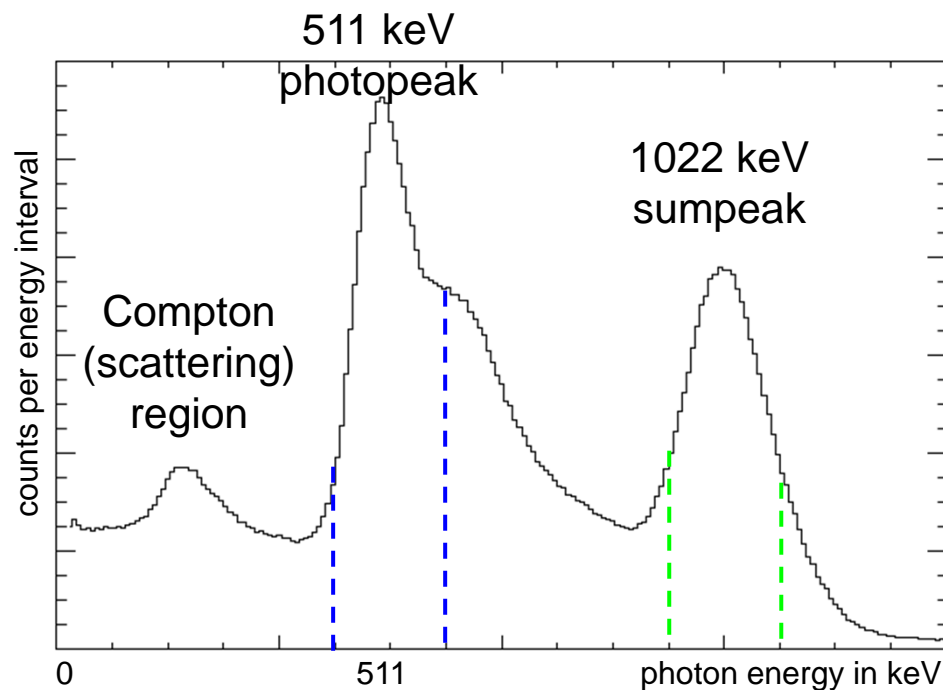
H02488_1.tar is a TARFILE and contains

H02488_lm1_1.hc
H02488_lm1_1.fdef
H02488_lm1_1.sif ← *scan information file*
H02488_lm1_1.Hc_Info
H02488_lm1_1.LmSort_Info

Scintillation Detectors: NaI, BGO, LSO etc

	Sodium iodide NaI	Bismut germanate BGO
density	3.7 g·cm ⁻³	7.1 g·cm ⁻³
effective atomic number	51	75
relative scintillation efficiency	100	15
scintillation decay time	230 ns	300 ns

Energy spectrum of a β^+ emitting isotope



measurement
of exhaled air

lower energy
window

upper energy
window

cnt file:

channel 1

channel 3

channel 2

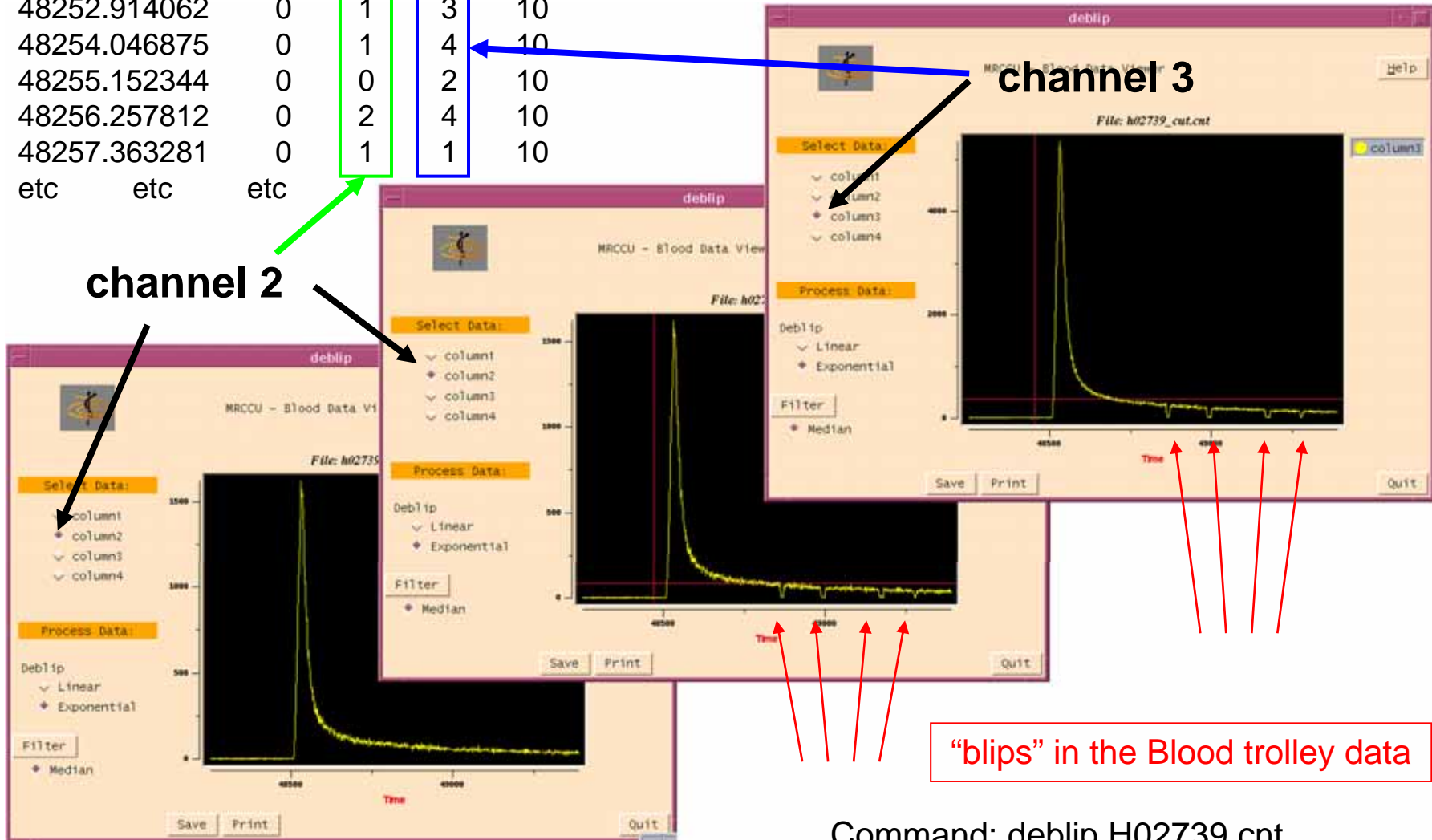
“Deblip” the cnt File

```

01/08/2002 13:24:12 - 5 2 H02739 PTFE 100 BP4 C11 BGO3 10
48252.914062    0    1    3    10
48254.046875    0    1    4    10
48255.152344    0    0    2    10
48256.257812    0    2    4    10
48257.363281    0    1    1    10
etc      etc      etc
    
```

channel 2

channel 3



“blips” in the Blood trolley data

Command: deblip H02739.cnt

Check the metab File with BLT

Use the Blood Lab Tool to display the data:

matlab6 -nojvm

>> blt

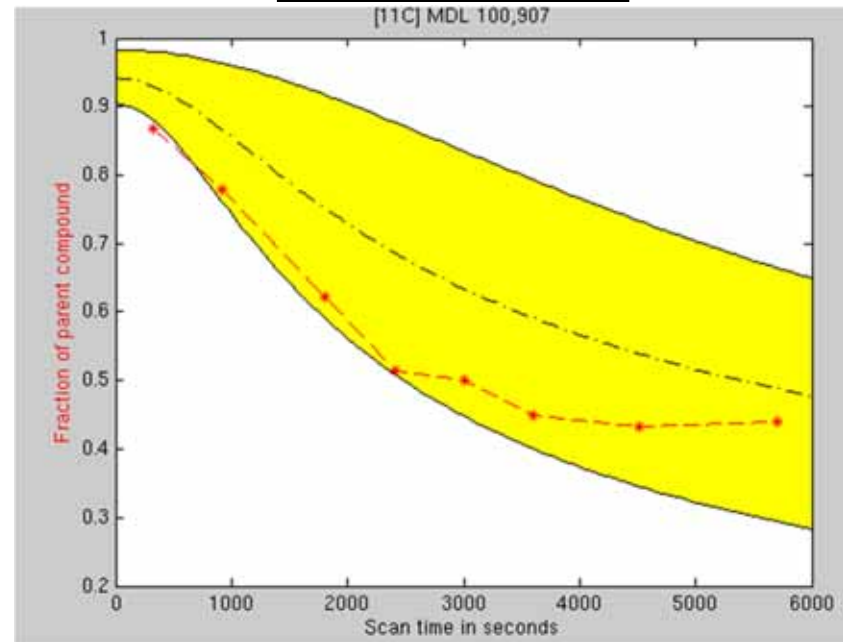
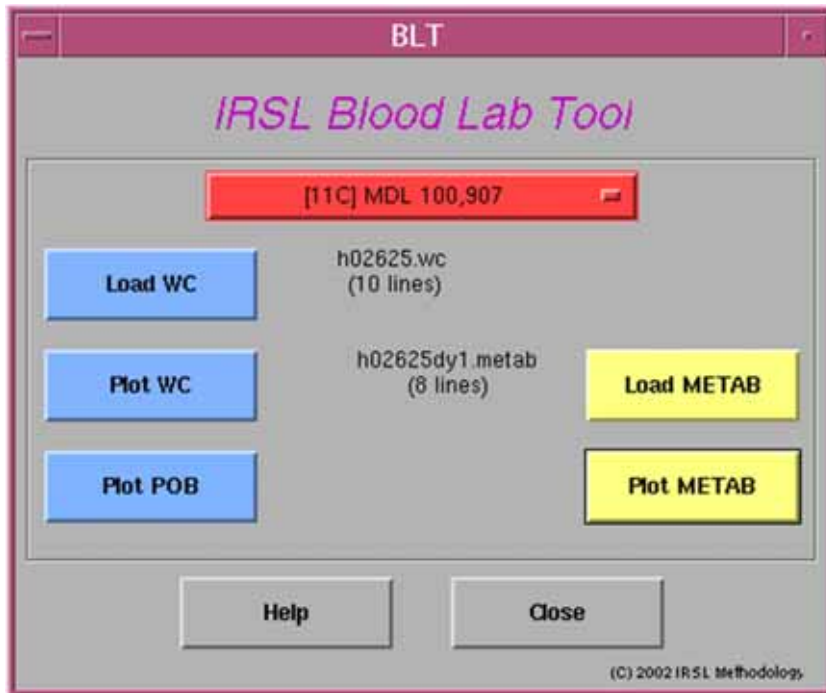
h02625dy1.metab:

8	
318.5	0.8671
919.0	0.7778
1806.5	0.6230
2407.0	0.5137
3009.0	0.5014
3605.0	0.4491
4511.5	0.4321
5706.0	0.4394

number of lines

time in s

parent fraction in plasma



Check the wc File with BLT

haematocrit dummy value →
 number of lines →

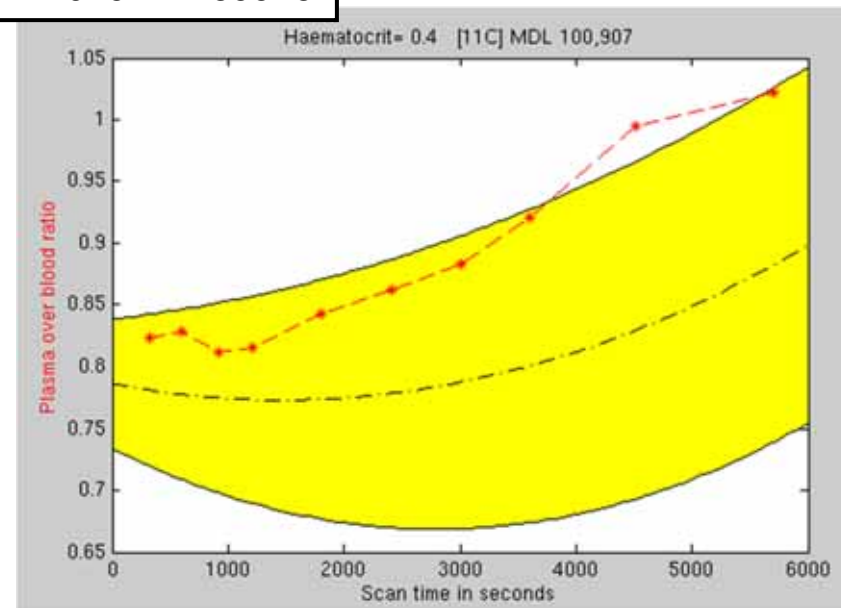
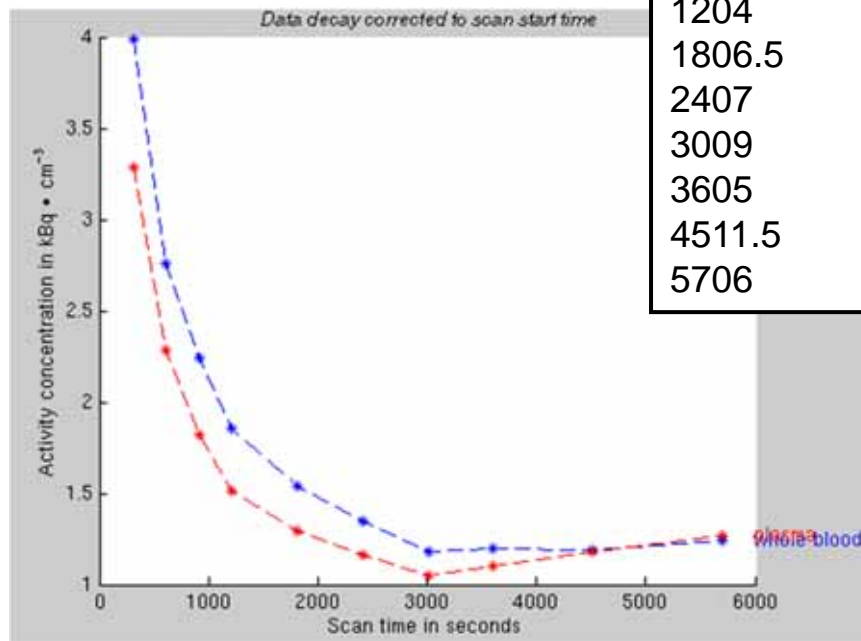
h02625.wc:

time in s

0.40		
10		
318.5	3.990092	3.284030
608	2.757863	2.285487
919	2.239662	1.817578
1204	1.855813	1.514535
1806.5	1.536663	1.295794
2407	1.342906	1.157941
3009	1.182170	1.044542
3605	1.196145	1.101852
4511.5	1.188292	1.181372
5706	1.242049	1.269926

whole blood activity
 concentration in kBq·ml⁻¹
 (decay corrected)

plasma activity
 concentration in kBq·ml⁻¹
 (decay corrected)



Generate Input Functions with COMIF

Call CLICKFIT within Matlab 6:

```
matlab6 -nojvm
```

```
>> RUN_CLICKFIT
```

Select the radioligand

Load SIF, METAB, WC and deblipped CNT files

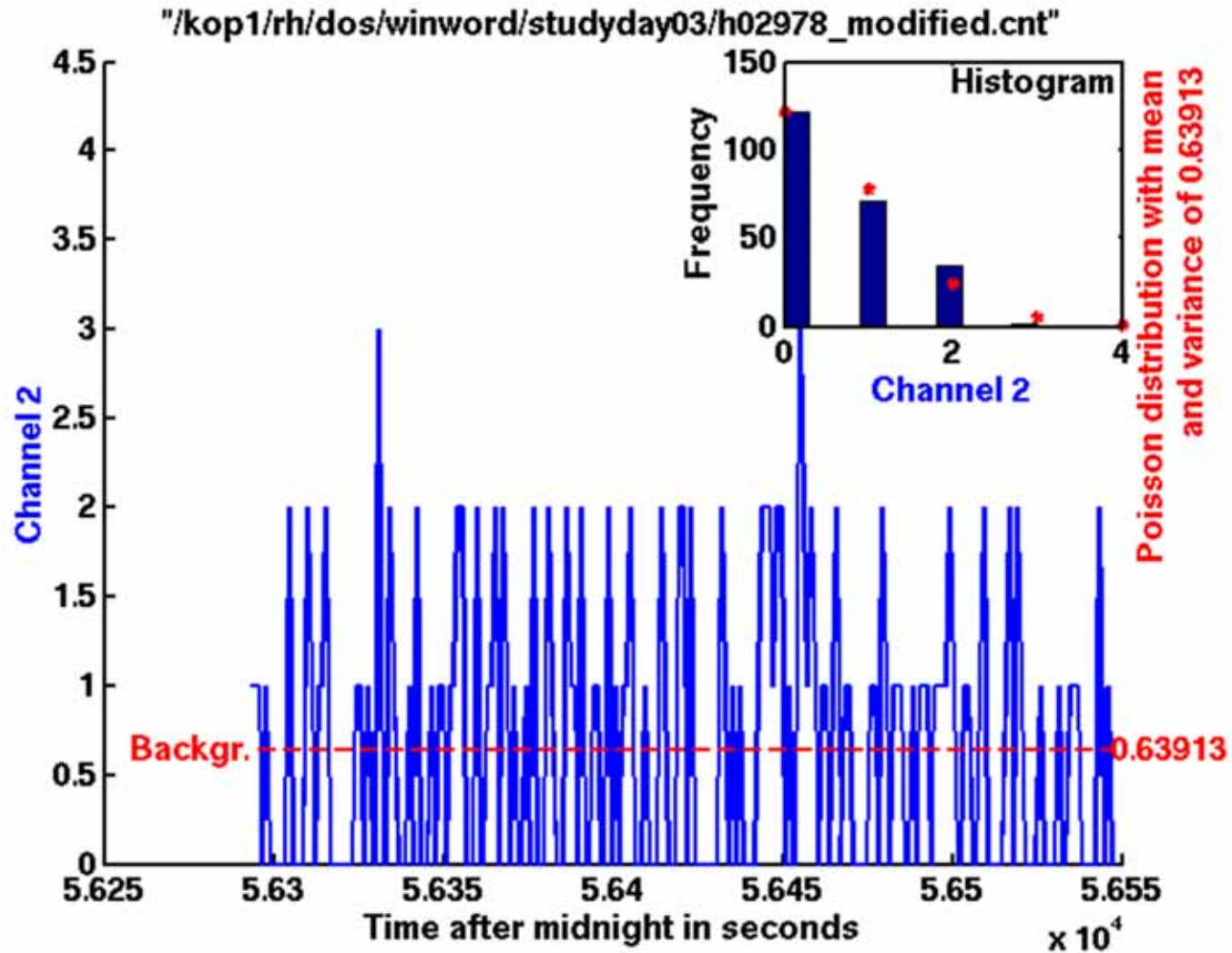
Set the isotope

Load STATS	STATS2IDWC	STATS2RREG	SIF	Plot
Load SIF	h02488.sif	Sum STATS	Decay corr OFF	Clear
Load METAB	h02488dy1.meta	METAB2IDWC	-	New Fig
Load WC	h02488.wc	POB2IDWC	red	Save EPS
Load CNT	h02488_modified.	(11C) Ro 71-0787	GENIF	COMIF

RUN CLICKFIT Version 1.55 as of 03/01/23 by Vin Cunningham, Federico Türkheimer, Marie-Claude Asselin and
Diary started 04/03/2003 16:05:23

straight line Carbon 11 amoeba fit model Go

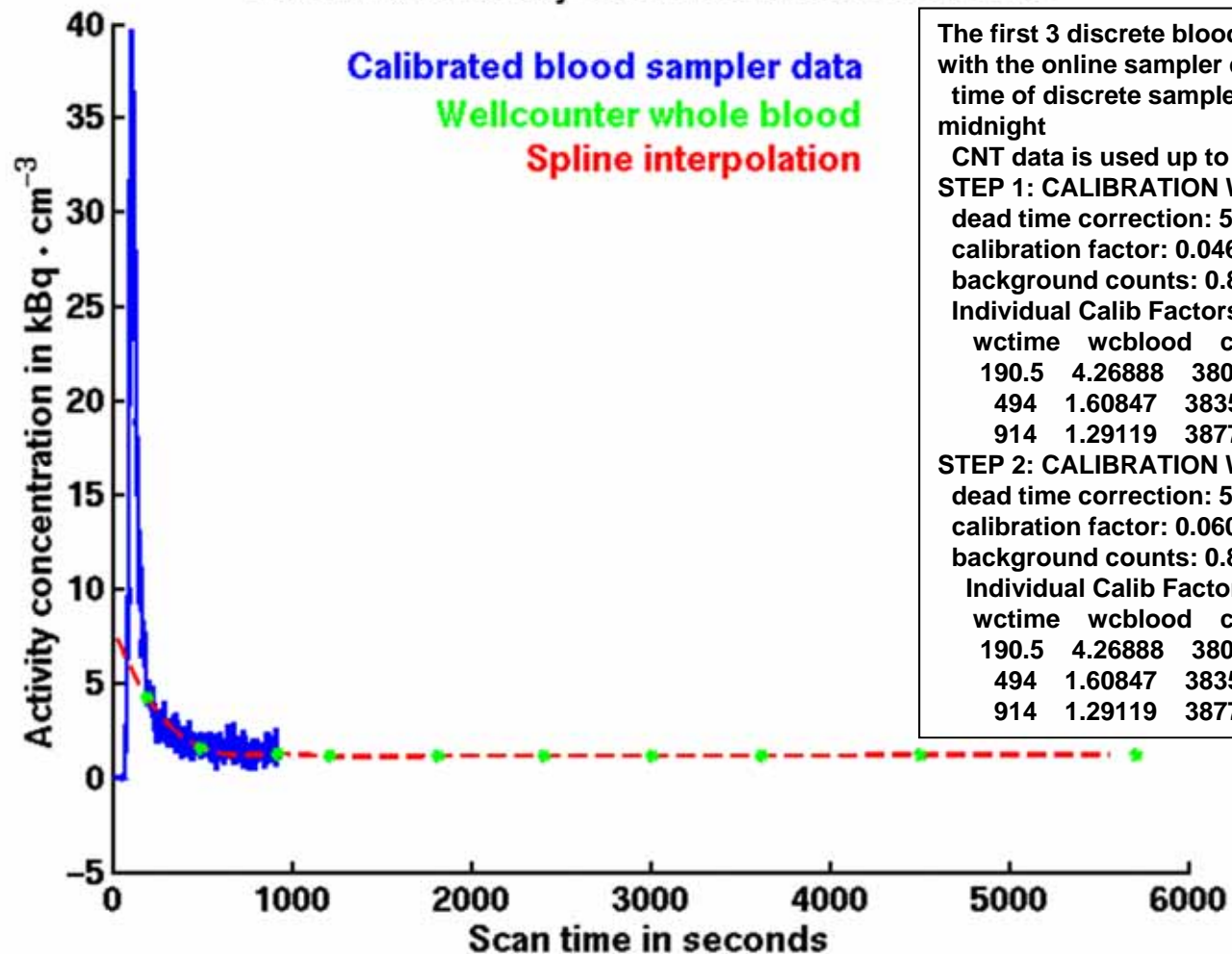
COMIF Step 1: Background Correction



COMIF Step 2: Whole Blood Cross Calibration

h02488: data decay corrected to scan start time

Output in the log window:



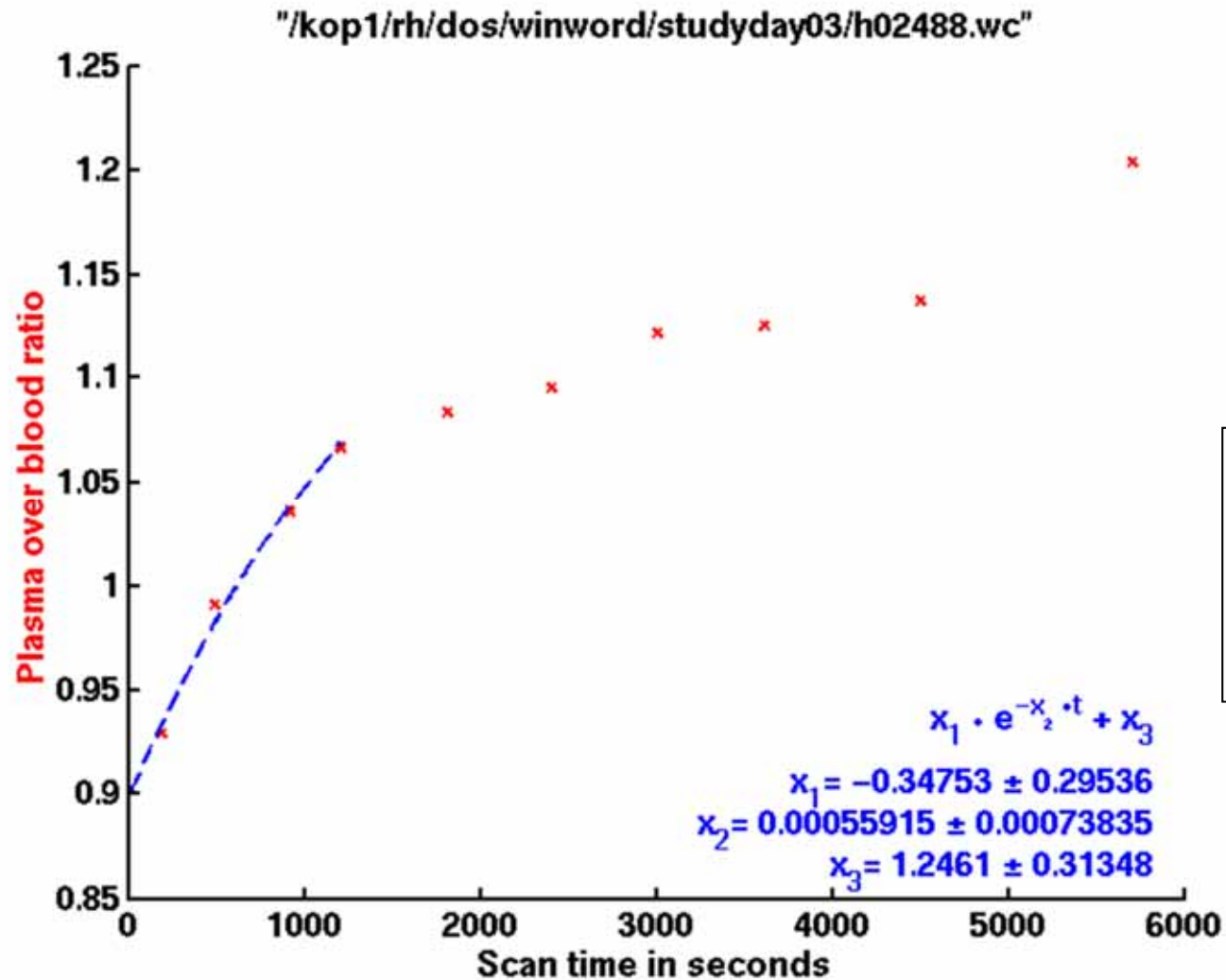
The first 3 discrete blood samples are used for cross-calibration with the online sampler data:
 time of discrete sample number 3: 914 s scan time = 38775 s after midnight
 CNT data is used up to 38775.1211 s after midnight
STEP 1: CALIBRATION WITH STANDARD FACTOR
 dead time correction: 5.4095e-06
 calibration factor: 0.0463
 background counts: 0.87399
 Individual Calib Factors

wctime	wcblood	cnttime	cnt	cntdec	rcf
190.5	4.26888	38052.6	2.95733	3.2942	1.29588
494	1.60847	38355.8	0.933065	1.23425	1.30319
914	1.29119	38775.1	0.592821	0.994739	1.29801

STEP 2: CALIBRATION WITH INDIVIDUALLY ADJUSTED FACTOR
 dead time correction: 5.4095e-06
 calibration factor: 0.060145
 background counts: 0.87399
 Individual Calib Factors

wctime	wcblood	cnttime	cnt	cntdec	rcf
190.5	4.26888	38052.6	3.84165	4.27926	0.997575
494	1.60847	38355.8	1.21208	1.60333	1.0032
914	1.29119	38775.1	0.770089	1.29219	0.99922

COMIF Step 3: POB Model for the First Part of the Scan

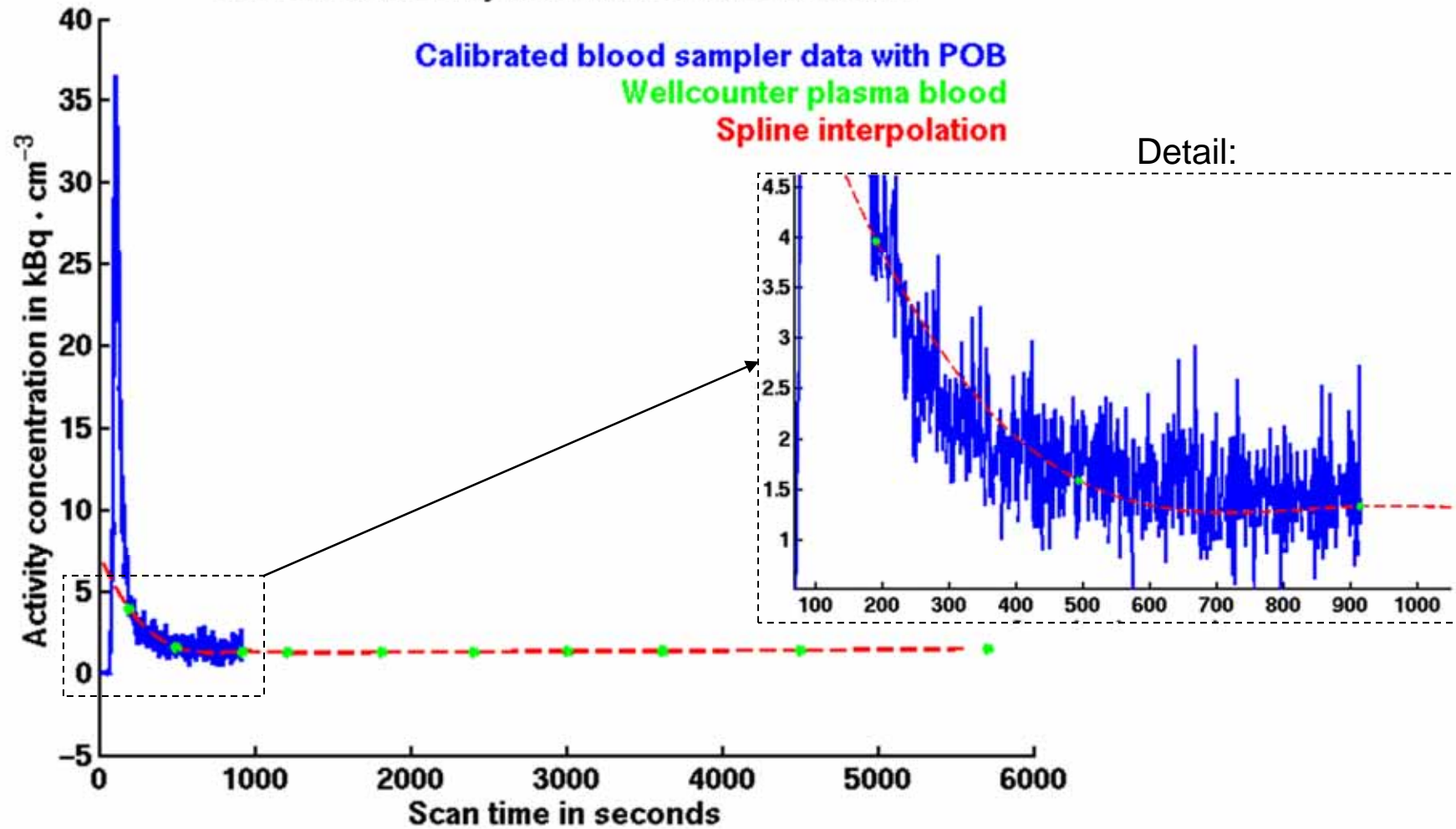


Output in the log window:

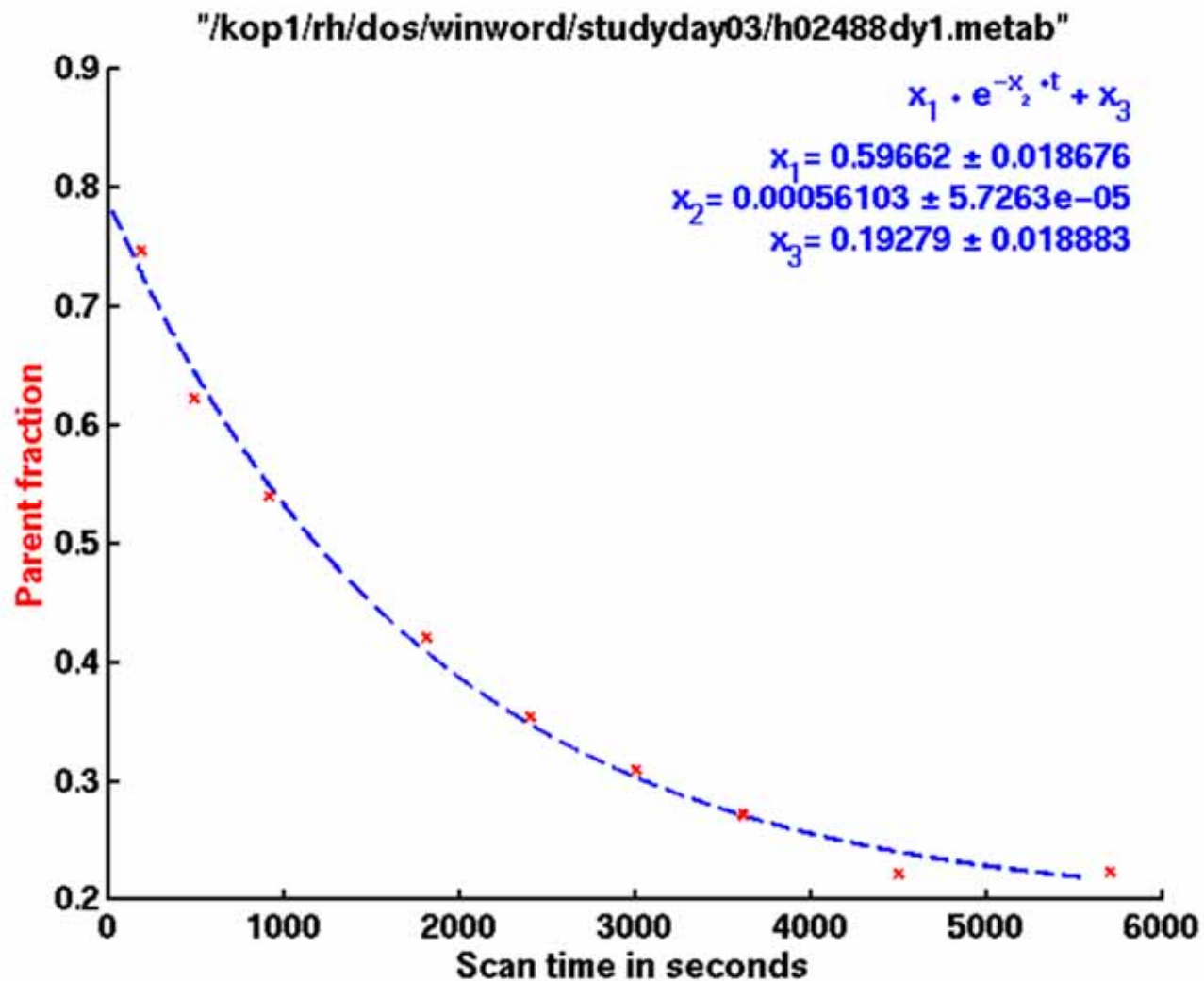
```
---- Fitting POB ratio ----  
4  
190.5  0.9287698  2.383008  
494    0.9911033  0.8150785  
914    1.035766   0.6123486  
1205.5 1.0666458  0.5432006  
pobmodel "4 expconst"
```

COMIF Step 4: Total Plasma Input Function

h02488: data decay corrected to scan start time



COMIF Step 5: METABOLITE Model for the Whole Scan



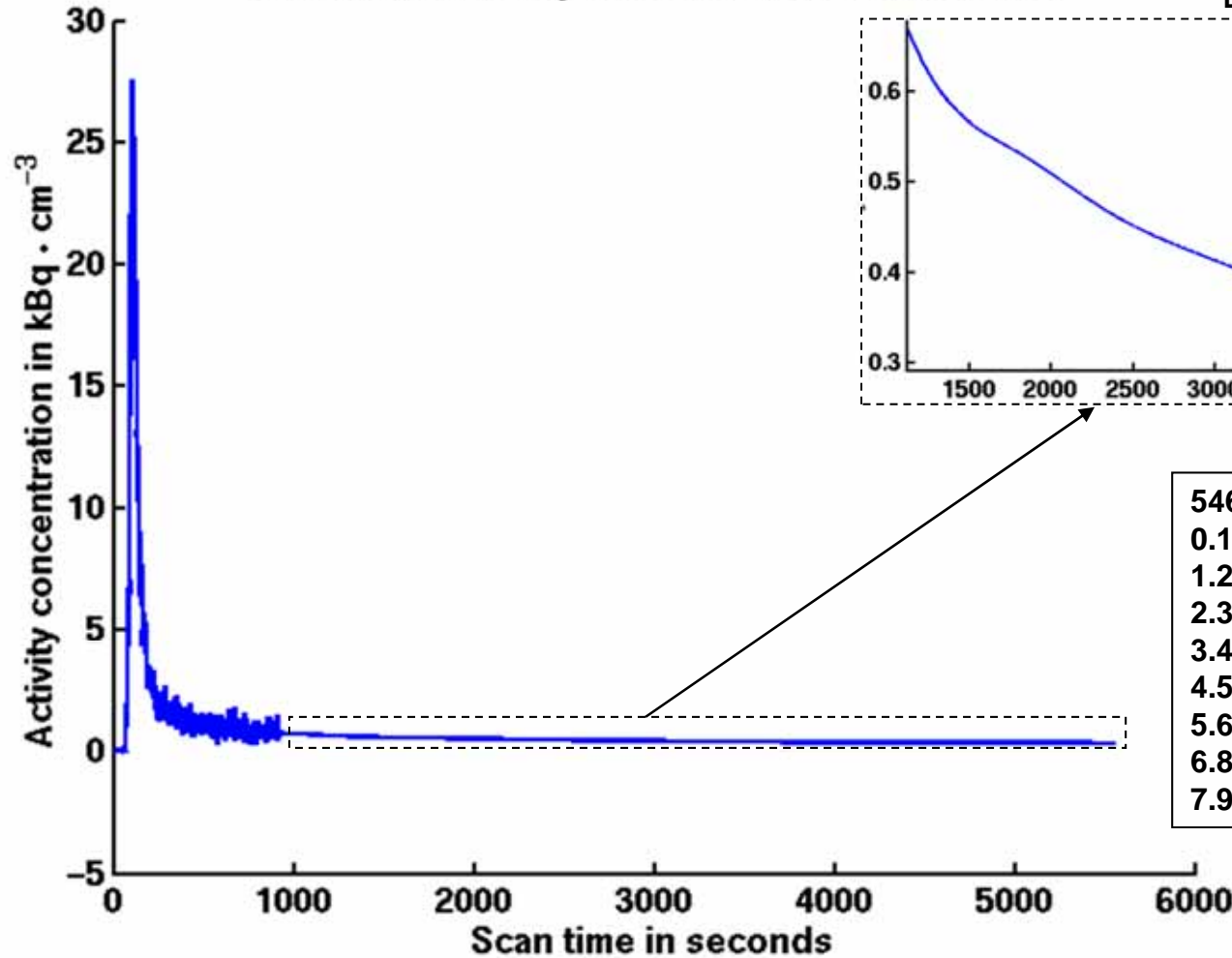
Output in the log window:

---- Fitting Metabolite Data 1 ----		
9		
190.5	0.7472	1
494	0.6231	1
914	0.5404	1
1812	0.4207	1
2405.5	0.3539	1
3007	0.309	1
3616.5	0.2721	1
4504	0.2216	1
5704.5	0.2242	1
metabmodel "4 expconst"		

COMIF Step 6: Parent Plasma Input Function

h02488: data decay corrected to scan start time

Detail:



5465	<i>number of lines</i>	
0.167969	0.00537605	0.00757944
1.27344	0.00537482	0.00757944
2.38281	-0.0372675	-0.0525658
3.48828	-0.0372589	-0.0525658
4.59375	-0.0372503	-0.0525658
5.69922	0.0479819	0.0677253
6.80469	-0.0372332	-0.0525658
7.91406	-0.0372245	-0.0525658

time in s *parent in plasma activity concentration in kBq·ml (decaying!)* *whole blood*